MDOT
Michigan Department of Transportation

ENGINEERING OPERATIONS COMMITTEE
MEETING MINUTES
MAY 1, 2001 - 1:30 P.M.
EXECUTIVE CONFERENCE ROOM

Present:	C. T. Maki	J. D. Culp	P. F. Miller
	J. D. O'Doherty	T. E. Davies	J. W. Reincke
	T. Fudaly	S. Bower	
Guests:	T. Myers	C. Libiran	J. T. LaVoy
	M. VanPortFleet	D. Juntunen	

OLD BUSINESS

1. **Approval of the Minutes of the February 1, 2001, Meeting - C. T. Maki**

Minutes of the December 6, 2000, meeting were approved with the following correction:

NEW BUSINESS, Item 3 - Cold-in-Place Recycling Candidate

Tom Maki announced a subcommittee to review potential submittals to EOC prior to implementation. The committee members are as follows:

Gary Taylor (Chair), Judy Ruszkowski, John Staton, Carlos Libiran, Glenn Bukoski, Thom Davies, and ***Tom Fudaly***.

NEW BUSINESS, Item 5 - Aesthetic Policy Implementation

Thom Davies and Paul Miller will co-chair a committee that will draft an implementation plan and a philosophy for aesthetic guidelines. Members of the committee will include Lynn Lynwood, ***Dave Calabrese***, and representatives from Maintenance, Planning, and the regions.

NEW BUSINESS

1. **Research Report R-1384, *Electrochemical Chloride Extraction* - J. W. Reincke**

Corrosion of steel reinforcement in concrete bridge decks and substructures is caused by the ingress of chloride ions from deicing salts. Chloride ions perpetuate corrosion by destroying the passivity of the steel in the alkaline environment of the surrounding concrete. The formation of oxide by-products occupies several times the volume of the original steel thus exerting tensile stresses greater than the tensile stress of concrete. These stresses produce cracks and spalls in the concrete that further accelerate the corrosion process. Continued

damage to the concrete requires repair and may eventually lead to premature replacement of the affected structural element.

An experimental process, Electrochemical Chloride Extraction (ECE), was applied to one bridge substructure. Preliminary results are promising, but it is recommended that ECE be further studies with additional field trials. Treating substructures with at least 10 years of remaining service life or that require minimum repair is desirable to maximize the benefits of ECE.

ACTION: EOC approved the report, which will be published and distributed. The committee authorized further field study of the ECE process. Research will work with Bridge Design in selecting four more trial bridges. The final analysis will include the effect on life cycle costs and other economic benefits derived from using ECE.

2. **Pavement Selections - S. Bower**

A. I-96 Reconstruction: CS 23152, JN 45640

The construction alternates considered were a flexible bituminous pavement (Alternate 1), and a jointed reinforced concrete pavement (Alternate 2).

A life cycle cost analysis was performed and Alternate 2 was approved based on having the lowest Equivalent Uniform Annual Cost. The pavement design and cost analysis summary are as follows:

Alternate 2A Reconstruction: Jointed Reinforced Concrete Pavement (Grade Cannot be Raised to Utilize Existing Subbase) (13.3% of Job)

280mm . . . . Jointed Reinforced Concrete Pavement (Mainline) (8.0m jt spacing)
140mm . . . . . Bituminous Mix 4C and 3C (Shoulders)
100mm . . . . . Open Graded Drainage Course
Geotextile Separator
150mm . . . . . Open Graded Underdrains
300mm . . . . . Sand Subbase
680mm . . . . . Total Thickness

Alternate 2B Reconstruction: Jointed Reinforced Concrete Pavement (95mm Grade Raise) (58.2% of Job)

280mm . . . . Jointed Reinforced Concrete Pavement (Mainline) (8.0m jt spacing)
140mm . . . . . Bituminous Mix 4C and 3C (Shoulders)
100mm . . . . . Open Graded Drainage Course
Geotextile Separator
150mm . . . . . Open Graded Underdrains
46mm . . . . . Sand Subbase
254mm . . . . . Ex. Subbase
680mm . . . . . Total Thickness

Alternate 2C Reconstruction: Jointed Reinforced Concrete Pavement (600mm Grade Raise) (28.5% of Job)

280mm . . . . Jointed Reinforced Concrete Pavement (Mainline) (8.0m jt spacing)
140mm . . . . . Bituminous Mix 4C and 3C (Shoulders)
100mm . . . . . Open Graded Drainage Course
Geotextile Separator
150mm . . . . . Open Graded Underdrains
300mm . . . . . Sand Subbase
680mm . . . . . Total Thickness

Present Value Initial Construction Costs . . . . . $497,367/directional kilometer
(Composite Cost of 2A, 2B, and 2C)
Present Value Initial User Costs . . . . . $280,676/directional kilometer
Present Value Maintenance Costs . . . . . $89,947/directional kilometer

Equivalent Uniform Annual Cost . . . . . $54,353/directional kilometer

B. I-69 Reconstruction: CS 12033, JN 49921

The reconstruction alternates considered were a flexible bituminous pavement (Alternate 1) and a jointed plain concrete pavement (Alternate 2).

A life cycle cost analysis was performed and Alternate 2 was approved based on having the lowest Equivalent Uniform Annual Cost. The pavement design and cost analysis summary are as follows:

Alternate 2 Reconstruction: Jointed Plain Concrete Pavement

280mm . . . . . Jointed Plain Concrete Pavement (Mainline) (4.5m jt spacing)
Freeway Shoulder Option
100mm . . . . . Open Graded Drainage Course
Geotextile Separator
150mm . . . . . Open Graded Underdrains
300mm . . . . . Sand Subbase
680mm . . . . . Total Thickness

Present Value Initial Construction Costs . . . . . $368,924/directional kilometer
Present Value Initial User Costs . . . . . $18,668/directional kilometer
Present Value Maintenance Costs . . . . . $59,840/directional kilometer

Equivalent Uniform Annual Cost . . . . . $28,018/directional kilometer

3. **Plastic Pipe, 30 and 36 in. - M. VanPortFleet**

The industry has requested four specific changes to our specifications. These need to be carefully reviewed. A subcommittee of Jim Culp, Paul Miller, Roger Till and Mark VanPortFleet will consider the requested changes and will report back to EOC in June with recommendations.

4. **Michigan Guardrail Crash Testing - T. Myers**

MDOT crash tests of the Michigan w-beam guardrail failed to meet the requirements of NCHRP Report 350. Subsequent finite element analysis provided by FHWA on the Michigan standard produced the same result. Our use of the standard flat faced wood offset block is the only component that separates our design from an FHWA passing design that uses a routed block. FHWA believes that the routed block adds strength to the system.

It is recommended that we discontinue further guardrail crash testing and adopt the routed block for w-beam guardrail and for thrie beam guardrail as well.

ACTION: The recommendation is approved. When newer guardrail sections originally installed with routed blocks are damaged, they will be repaired using routed blocks. We will look into the feasibility of having the existing supply of flat blocks (maintenance stock) routed before using as replacements.

5. **Proposed Experimental Carbide Milling Project - S. Bower**

Conventional diamond grinding to improve ride quality on rigid pavements is very costly. There are new advancements in carbide milling technology for application on rigid pavements that may produce improved ride quality at a lower cost. We have never conducted a formal evaluation that tracks performance, evaluates potential problems, and assesses the cost effectiveness of carbide milling on rigid pavements.

The Southwest Region is requesting to carbide mill about three miles, north and southbound, on US-131 between Three Rivers and Schoolcraft. The region, with the assistance of the Construction and Technology Division, will evaluate the project using AASHTO protocols. Written reports will be issued at the end of construction and at the end of the two year evaluation period. The final report will include an analysis of the cost-effectiveness and potential benefits of carbide milling, as well as an assessment of pavement performance.

ACTION: The expenditure of Southwest Region maintenance funds to establish a 2001 construction season test section for carbide milling is approved. It is suggested that a one mile section of diamond grinding be included, and that the Construction and Technology Division evaluate the skid resistance and the noise levels on all sections before and after to compare results.

6. **February 9 and 26, 2001 Pavement Committee Minutes - S. Bower**

The minutes of the February 9 and 26, 2001, meetings were reviewed.

ACTION: The minutes were approved for distribution (attached).

(Signed Copy on File at C&T/Secondary)
Jon W. Reincke, Secretary
Engineering Operations Committee

JWR:kat
Attachment
cc: EOC Members
Region Engineers

G. J. Rosine	R. J. Risser, Jr. (MCPA)	L. Stornant	T. L. Nelson
R. J. Lippert, Jr.	A. C. Milo (MRBA)	J. Ruszkowski	R. D. Till
D. L. Smiley	J. Becsey (MAPA)	C. Libiran	M. Frierson
M. Nystrom (AUC)	D. Hollingsworth (MCA)	G. J. Bukoski	C. W. Whiteside
M. Newman (MAA)	J. Steele (FHWA)	K. Rothwell	T. E. Myers
J. Murner (MRPA)			

Pavement Committee
February 9, 2001 Meeting
Bay City TSC

Attending:

Steve Bower - Chair	Dave Smiley - Secretary	Rich Ostrowski (a)
Mike Frankhouse	Paul Steinman	Gonzalo Puente
John LaVoy	Robert Ranck, Jr.	
Larry Galehouse	Ryan Rizzo - FHWA	

(a) = absent
NOTES: Numerous staff from the Bay Region Office and other TSC's attended as guests.

There was no regular meeting held in January. Committee members approved the December 2000 meeting notes by e-mail. They were accepted by EOC at their February 1st meeting.

OLD BUSINESS

There were no old business agenda items. After introductions, Steve began the meeting by explaining the role and responsibilities of the Pavement Committee, which are detailed in a department guidance document. A copy was made available for meeting guests. Steve reminded everyone that meeting notes are distributed with EOC minutes, which should be circulated.

NEW BUSINESS

#01-01P SP for Pavement Acceptance

Mike Frankhouse reminded the group that the Special Provision for *"Pavement Acceptance for Superpave E10, E30, and E50 Bituminous Mixtures"* needs to be included in applicable projects, especially when a warranty applies. It's primary purpose is to define the acceptance criteria for construction acceptance. This acceptance is also the basis to initiate the warranty period. Discussion led to an explanation of a similar SP for jointed plain concrete pavement. Both SP's are due for an update that the committee will schedule for a future meeting. Comments are welcome from anyone who has had experience with either SP.

#01-02C/D Crack Sealing/Filling

Larry Galehouse reported on some product information he learned of while attending the TRB meeting in January. Crafco, Inc. supplies a material (Detack) that prevents tire tracking on fresh crack sealant. The material is applied as a finish coat at a rate of 1 gal/1000-2000sft. The expense is minimal (pennies). The specification will be modified to include a de-bonder material.

Cracfco, Inc. also supplies vacuum equipment that collects crack debris, etc. in lieu of using compressed, forced air. The equipment limits worker and motorist exposure to dust and flying particles. The vacuum provides a comparable crack condition to forced air.

Larry also provided two advisory points regarding paving affects on ride quality. He described how previously placed hot-pour crack sealant can liquify when hot bituminous mixture is placed over it. The new mat will then slip/shove above the crack and develop a speed "bump". The

type of roller can also affect ride quality. A single drive roller can cause bumps, while a dual drive roller will not induce bumps.

Region Discussion Items

Since the committee took the meeting "on the road" to promote a dialogue with the Region, time was allotted to address Region questions or issues. A summary of each discussion topic follows:

Warranties

The Region asked for an update on warranty usage. The distinction between current M&W warranties and the evolving performance warranty was explained. A performance warranty is planned for the next M-6 project for a Feb. 2002 letting. A performance warranty will substitute for present acceptance criteria and is acceptable to FHWA. The Contractor will be given considerable latitude for the design and material selection to ensure their responsibility for performance results. Administration of warranty projects has become a major department issue. Several Regions are developing a process to manage warranty projects.

Sampling Behind the Paver

Mike Frankhouse provided an update on last year's results and this year's usage of the SP. The SP was used on ten projects in 2000 (US-27 and M-90 in Bay Region). Both Contractor's and department staff were surveyed on the spec's pluses and minuses. A joint meeting was then held to discuss the survey results. Thus far, the feedback indicates the spec's benefits exceed it's disadvantages. Twenty-eight projects are planned for this year, which should expose the spec. to each TSC office.

Status of JRCP vs. JPCP

JPCP can be selected in lieu of JRCP, but only on an individual project basis with EOC approval, since the 350 lane-mile cap has been reached. JRCP remains the department standard for concrete pavement. A study will soon be completed that is investigating the causes of cracking on some recent JPCP projects. JPCP is acceptable for a project, but it's life cycle cost will be compared with JRCP.

Location of Research Projects in Bay Region

The Region is creating a data base of pavement inventory information. A component will be a description of any unique features (ie: old research project) regrading the pavement. Terry Palmer will request that C&T provide information about past research projects in the Bay Region.

Pavement Design Guidelines for Shoulder Mixes

For the 4' inside shoulder, the Region wants to allow the Contractor an option of using a "C" mix instead of the SuperPave mix designated for the mainline. The option may be more cost effective than present guidelines allow. However, this option will necessitate a "cold" joint, which will open over time and allow water to enter the pavement sub-structure. It was also mentioned that the unit price difference between "C" mixes and SuperPave is close enough in the Bay Region that a contractor would not likely take the option.

Update on US-23, south of I-75

US-23 is a JRCP concrete pavement that was reconstructed in 1992/93. The pavement has developed severe spalling at some transverse joints which is a result of several factors related to the concrete mixture. The pavement is part of a statewide department research project that is investigating the extent and types of material-related distress (MRD) that exist with concrete pavements. Additional coring and lab analysis is required to establish the extent of the MRD problem, before the right maintenance fix can be determined. That work is expected to initiate in March and take about 45-60 days to complete.

Performance of Rubblized Projects

Several past rubblized projects in the Region are exhibiting premature cracking (joint reflection and longitudinal). The Region estimates that earlier than planned maintenance will be required to sustain an expected 15-20 year design life. The question was raised whether it is appropriate to reduce the design life (DL) estimate for rubblized projects. As with all major R&R treatments, the DL value will be adjusted based on statewide results as condition data are collected and analyzed. A research project is investigating the causes for premature cracking on rubblized projects. Until the results of the project are known, it would be inappropriate to adjust the DL estimates, as the cause may not be related to the effects of rubblizing the concrete pavement.

Life Extension Estimates for PM

Several staff from the region questioned the accuracy of some life extension estimates provided in the CPM Guidelines. How the present values were determined was explained. The values are adjusted on a continual basis based on network performance. Larry Galehouse summarized the current three year contract project to review the performance of nine CPM treatments placed in 1994/5 for their effectiveness in terms of life extension gains and abiding by (assumed) warranty criteria. Steve Bower remarked that he would soon be issuing revised estimates for R&R projects to the Regions for the current CFP.

Notes:
C = work on item is completed
P = item is still pending additional committee action
D = discussion/information item
DLS: C&T 2-28-01 notes approved

PAVEMENT COMMITTEE

February 26, 2001
Construction & Technology Division
Special Meeting - Review Completed Research Projects

Attending

Steve Bower	John LaVoy
Dave Smiley	Gonzalo Puente
Larry Galehouse	Ryan Rizzo
Mike Frankhouse	Paul Steinman

The Committee met to review the final reports for the following research projects. The committee's objective was to decide on any implementation action based on the project's findings and recommendations. The MDOT project manager attended the meeting to provide a project summary for committee members.

Title - "Calibration of Michigan's Rut and Fatigue Distress Models and Development of an Overlay Design Procedure for MichBack"

MDOT Project Manager - Tom Hynes C&T
Contract Principal Investigator - Michigan State University

Abstract: The project upgraded the rut and fatigue model algorithms for MichPave, which is a mechanistic-based design program for flexible pavements. Thirty-nine sites, representative of the Michigan pavement network, were evaluated. The layer moduli were determined from MichBack. A sensitivity analysis was performed to check the validity of the new program results and compare them with typical material and cross section data. The validity of the rut model was also compared with the LTPP-GPS sections. The temperature correction portion was improved from actual data collected at previously established MDOT monitoring sites. An overlay design module was added to MichBack. It was derived from data from eight overlay projects. Comparisons of deflection responses were made before and after the overlay was placed.

Conclusions: The project achieved the plan objective to re-calibrate the model algorithms.

Action: No specific committee action regarding implementation is required. The department currently uses the 1993 AASHTO design procedure which is empirically based. The next version of AASHTO, currently be developed, will be mechanistic-based. The department is undecided about adopting the new AASHTO program. The upgrade of MichPave and MichBack were initiated to prepare for a likely change to a mechanistic-based procedure.

The program needs further testing before implementation can be considered. Comparison pavement designs using both procedures will be developed for routine projects to quantify cross section differences and their respective design lives.

Title - "Improvement of MichPave and MichBack"
MDOT Project Manager - Tom Hynes C&T
Contract Principal Investigator - Michigan State University

Abstract: The project developed a new pavement design software system for flexible pavements that integrates current separate programs. The Michigan Flexible Pavement Design System (MFPDS) is based on a Microsoft Windows 95/98NT platform. It contains four modules; AASHTO design, mechanistic analysis, mechanistic design using MichPave, and back-calculation with MichBack with an overlay design feature. The MFPDS contains the new re-calibrated versions of MichPave and MichBack. MSU also developed an operational "user's guide".

Conclusions: The project achieved the objective to develop a functional MFPDS.

Action: MFPDS will be tested to ensure no "bugs" exist. After verification, the AASHTO module will be used by Curtis Bleech for routine R&R design and analysis needs. Before distribution takes place; users need to be identified, the "users guide" needs some enhancement, and some hands-on user training is desirable. These needs will await a decision to adopt a mechanistic-based design procedure.

Title - "The Engineering Characteristics of Michigan's Asphalt Mixtures"
MDOT Project Manager - Gerald Sweeney C&T
Contract Principal Investigator - Michigan State University

Abstract: The project report documents the results of testing to determine the resilient modulus and other engineering properties of typical bituminous mixtures currently used by the department. The information is essential input data for a mechanistic-based design procedure. Testing was done on both laboratory prepared samples and project field cores for both older Marshall mixtures and present SuperPave mixtures. Back-calculated values from FWD deflection testing were also compared with lab results. The most notable finding was the variability in field air-void distribution and layer thickness. Based on test results, revised design layer coefficient values for the various mixtures were determined.

Conclusions: The testing showed a wide variation in mixture properties exists among older Marshall mixtures and newer SuperPave mixtures. The report also addressed some quality control deficiencies and ways to enhance project oversight to assure as-constructed results are documented, so they can be compared with design estimates.

Action: The committee had concerns about the reliability of the results for some mixture types. Additional testing is warranted to evaluate factors regarding where the field sample is taken (behind the paver) and the influence of modern binder modification. The C&T committee representatives will confer to develop a proposal for management approval to maintain a permanent department testing commitment for this important material characteristic.

DLS: C&T
accepted 3-07-01